

A NEW FOSSIL FRESHWATER CRAB FROM THE NGORORA FORMATION (MIOCENE) OF KENYA

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ABSTRACT

A new species of freshwater crab, *Potamonautes (Lirrangopotamonautes) tugenensis*, is described from the Miocene of the Tugen Hills, Kenya. It is compared with Recent species of *P. (Orthopotamonautes)* and *P. (Lirrangopotamonautes)*.

MATERIAL

DR MARTIN PICKFORD of Bedford College, London, whilst collecting fossil mammals from the Lake Baringo area of northern Kenya, collected a number of claystone nodules from the northern end of the Tugen Hills, about 20 miles (32 km) north-west of Lake Baringo. They came from the two neighbouring localities of Kamwina, Kabarsero area (Pickford locality 2/72) and Kalimale area (Pickford locality 2/68). The Kamwina locality is a lake shoreline deposit with diatomaceous shales and the Kalimale section is a relict river channel. Kamwina is Member C and Kalimale Member D of the Ngorora Formation of Miocene age, approximately $11-12 \times 10^6$ years (Bishop & Chapman 1970, Bishop, Chapman, Hill & Miller 1971). The Kalimale locality has yielded only isolated limb segments. For the latest assessment of the chronostratigraphy of the region, Berggren & van Couvering (1974) should be consulted.

The nodules collected by Dr Pickford contain freshwater crabs and ostracods. The brittle nodules are not laminated in any way so that attempts to break them open by hammer resulted in the shattering of the nodule. An attempt to develop the nodules by acid treatment was unsuccessful. It remained to split each one with a rock splitter, which was less damaging than the hammer but nevertheless reduced it to a number of fragments that had to be glued back together. If there was any preferred plane of splitting it was through the abdomen and along the smoother subhepatic and pterygostomial areas. Even though the specimens are in nodules they are crushed. Fortunately Dr Pickford had collected one specimen, the holotype, which had weathered free of matrix and was not badly crushed, and also some isolated segments of limbs. Altogether about 50 nodules were collected that contained crab remains. The limb fragments from Kalimale are not sufficiently different to suggest that a second species is present, but limb fragments are not very diagnostic. A modern freshwater crab species would probably not occupy both such diverse habitats as river channels and lake shores, since this would involve different water speeds, temperature and bottom conditions. Hence it is possible

that a second species is present, but that problem can only be resolved by more and better material from Kalimale.

SYSTEMATICS

Section BRACHYRHYNCHA Borradaile 1907

Superfamily XANTHOIDEA Dana 1851

Family POTAMIDAE Ortmann 1896

Genus *POTAMONAUTES* Macleay 1838

TYPE SPECIES. *Thelphusa perlata* H. Milne-Edwards 1837, by subsequent designation of Rathbun 1905 : 159.

Subgenus *LIRRANGOPOTAMONAUTES* Bott 1955

TYPE SPECIES. *Potamon (Potamonautes) lirrangensis* Rathbun 1904, by original designation of Bott 1955 : 264.

Potamonautes (Lirrangopotamonautes) tugenensis sp. nov.

Pl. 4, figs 1-6

DIAGNOSIS. A *Lirrangopotamonautes* with strongly produced front and medially divided urogastric area, single spines on the carpus and on the otherwise smooth merus.

MATERIAL. One more or less complete carapace, 50 distorted and fragmentary carapaces and some isolated chelipeds. The holotype and most of the paratypes are in the National Museum of Kenya, Nairobi. The remaining paratypes (nos In 61517-24) are in the British Museum (Natural History), London. The material comes from two Miocene localities in the Ngorora Formation, at Kamwina and Kalimale about 20 miles (32 km) NW of Lake Baringo, Tugen Hills, Kenya.

DESCRIPTION. Carapace one quarter wider than long at its widest point about one third back. The front is moderately long and strongly produced with only a slight ventral deflection; it is smooth and occupies about one third of the anterior carapace width. The anterior margin is smooth and strongly sinuous with a thickened edge. On the holotype one ocular peduncle is preserved. The post-frontal crest is strong, overhangs the front and is nearly straight with a slight deflection towards the front at the mid-line; it meets the anterolateral margin at an obtuse angle. The postfrontal crest and anterolateral margins are smooth or slightly beaded. The margins of the orbits are entire, thickened and smooth. The single extraorbital spine is well developed. The median furrows join at or only just posterior to the postfrontal crest and pass forward on to the frontal area, cutting the frontal area into two. The lateral margins are convex anteriorly and may be slightly concave posteriorly.

The anterolateral marginal ridge passes up on to the dorsal carapace just behind the widest part of the carapace. The posterolateral marginal ridge starts below the

point at which the anterolateral marginal passes on to the dorsal carapace, and goes in an anteroventral direction.

The hepatic areas are inflated and traversed by two rows of pits. The line of the pits curves proximally across the branchial area to join the cervical groove opposite the widest part of the mesogastric area. The urogastric area is clearly delimited by the cervical groove and the furrow between the uro- and metagastric areas. The urogastric area is divided by a longitudinal furrow. The proximal walls of the cervical groove are deeply hachured on the internal mould (and probably also on the shell itself). The cervical groove is deep medially but becomes shallower anterolaterally. The rhomboidal branchial areas are inflated and covered with feeble rugosities.

The ventral surface is poorly preserved—usually only the first four thoracic sternites or hemisternites are preserved. No abdomina have been found except for one poorly preserved female, of which the segments appear simple and not fused. The third maxilliped is reasonably well preserved although no merus has yet been found. The ischium is broad and subrectangular; it bears a groove parallel to the inner margin and about one third in. The exopodite is about a third of the width of the ischium and tapers anteriorly. The posterior inner angles of the ischia close against a knob-like anterior extension of the first thoracic sternite, which has the shape of a 'parson's nose'¹. The lateral flanges of the anterior extension have two small swellings, sometimes extended into ridges, one on each flange. Although corresponding depressions have not been found on the underside of the ischia, they appear to have a press-stud effect presumably to locate accurately the third maxilliped when it is closed. The fingers of the larger, right, cheliped are approximately the same length as the palm and are gently curved towards the mid-line. The fingers are grooved laterally and bear large teeth. There is virtually no gape between the fingers, which are opposed throughout their length. The smaller cheliped is similar to the larger one except that the palm is narrower and the teeth of the fingers fine with an occasional larger tooth. The smooth carpus bears a single spine at the distal end of the inner marginal ridge. The ridge is sharp and strongly elevated. The merus also bears a single spine at the distal end of its inner marginal ridge but the outer marginal ridge is strong and smooth or may possibly have a few coarse granules.

DISCUSSION

Very few species of freshwater crabs have been found fossil and this is the first that can be assigned to a Recent genus. The form of the postfrontal crest and the shape and position of the epibranchial angle clearly indicate that it belongs to the Recent African genus *Potamonautes*. *Potamonautes* was split by Bott (1955) into fifteen subgenera, to a large extent on the form of the gonopods. However there are sufficient carapace differences to allow the fossils to be compared with the two subgenera *Lirrangopotamonautes* and *Orthopotamonautes*. Bott (1955: 310) erected four new genera for fossil species of potamid crabs, but stated that on the characters

¹ Pygostyle of domestic fowl.

of the carapace, which alone is usually preserved, the fossil species could be compared with Recent species. The closest species to the present fossils are the living *P. (Orthopotamonautes) depressus* (Krauss) and *P. (Lirrangopotamonautes) lirrangensis* (Rathbun). Both these are restricted geographically to central and east Africa at the present time. *O. depressus* has a weakly produced or even deflected front whereas *L. lirrangensis* has a strongly produced front similar to *L. tugenensis*. However *L. lirrangensis* has a denticulated anterolateral border and three rows of denticles on the merus of the cheliped. The widest part of the carapace of *O. depressus* lies just in front of the anterior third, whilst that of *L. tugenensis* lies just behind.

The many species of *Potamonautes* are distributed through central and southern Africa, especially in the tropical belts and the Rift Valley system. The majority have discontinuous distributions at the present day in the cooler water of the montane regions where they are found in many habitats from rapid-flowing rivers to shallow trickles or even standing water (Williams 1968). But some species groups, e.g. the *O. johnstoni* group (Williams 1968) to which *L. tugenensis* probably belongs, prefer the slow-moving warmer waters of the lakes and especially the coastal belts. The Kamwina fossils appear to come from lacustrine deposits in which the water could have been warm and slow-moving. The discontinuous occurrences of the Recent species appear to reflect a residuum of previous land forms. The single fossil species does not allow any reconstruction of previous drainage patterns, but a number of occurrences might give some clue both to the evolution of the drainage pattern and to the interrelationship of the many species of freshwater crabs from east Africa. Dr Keith Bannister is at present trying to unravel the drainage pattern of east Africa by studying the interrelationships of various species of the large fish *Barbus* which are also distributed through many separated bodies of water (personal communication).

Although *L. tugenensis* is the first fossil freshwater crab from Africa that can be assigned with any certainty to a modern genus, Joleaud & Hsu (1935 : 108 ; fig. 11) published a specimen, described as 'Potamonidé gen. nov.', from Cenomanian terrestrial deposits of Tanout, Niger (Furon 1935 : 35), which is difficult to assess from the outline figure. Unfortunately the figured specimen cannot be found at present in Paris. In the form of the postfrontal crest it could certainly belong to the Potamidae near *Potamonautes* but the two lateral crests do not conform to any Recent genus.

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PLATE 4

Potamonautes (Lirrangopotamonautes) tugenensis sp. nov.

Member C, Ngorora Formation, Miocene ; Kamwina, Kenya

- FIG. 1. Holotype, Kenya National Museum. Dorsal carapace. $\times 1.5$.
FIG. 3. Paratype, Kenya National Museum. Sternum and ischium. $\times 3$.
FIG. 4. Paratype, Kenya National Museum. $\times 1.2$.
FIG. 5. Paratype, Kenya National Museum. Mesogastric and urogastric areas. $\times 3$.
FIG. 6. Paratype, Kenya National Museum. Sternal 'knob'. $\times 3$.

Member D, Ngorora Formation, Miocene ; Kalimale, Kenya

- FIG. 2. Kenya National Museum. Merus and carpus of left cheliped showing single carpal spine. $\times 1.75$.

